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19. $y = \dfrac{3}{\sqrt{2x+1}} = 3(2x+1)^{-\frac{1}{2}}$

$$\frac{dy}{dx} = -\frac{3}{2}(2x+1)^{-3/2}(2) = \frac{-3}{(2x+1)^{3/2}}$$

21. $y = \sin^2(3x-2) = (\sin(3x-2))^2$

$$\frac{dy}{dx} = 2(\sin(3x-2))(\cos(3x-2))(3)$$
$$= 3\cdot 2\sin(3x-2)(\cos(3x-2))$$
$$= 3\sin(2(3x-2))$$
$$= 3\sin(6x-4)$$

23. $y = (1+\cos^2(7x))^3 = (1+(\cos(7x))^2)^3$

$$\frac{dy}{dx} = 3(1+(\cos(7x))^2)^2(2\cos(7x))(-2\sin(7x))\cdot 7$$
$$= -3\cdot 2\cdot 7(1+\cos^2(7x))^2(2\sin(7x)\cos(7x))$$
$$= -42(1+\cos^2(7x))^2(\sin(14x))$$

27. $r = \sqrt{\theta\sin\theta} = (\theta\sin\theta)^{\frac{1}{2}}$

$$\frac{dr}{d\theta} = \frac{1}{2}(\theta\sin\theta)^{-\frac{1}{2}}(1\cdot\sin\theta + \theta\cdot\cos\theta)$$
$$= \frac{\sin\theta + \theta\cos\theta}{2\sqrt{\theta\sin\theta}}$$

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29. $y = \tan x$

$$\frac{dy}{dx} = \sec^2 x = (\sec x)^2$$

$$\frac{d^2y}{dx^2} = 2(\sec x)(\sec x \tan x) = 2\sec^2 x \tan x$$

31. $y = \cot(3x-1)$

$$\frac{dy}{dx} = -\csc^2(3x-1)\cdot 3 = -3(\csc(3x-1))^2$$

$$\frac{d^2y}{dx^2} = -6(\csc(3x-1))(-\csc(3x-1)\cot(3x-1)\cdot 3)$$

$$= +18\csc^2(3x-1)\cot(3x-1)$$

33. $f(u) = u^5+1 \quad u = \sqrt{x} \quad f(\sqrt{x}) = (\sqrt{x})^5+1$

or

$f(u) = u^5+1 \quad g(x) = \sqrt{x}$

$(f\circ g)(x) = f(g(x)) = (\sqrt{x})^5+1$

$(f\circ g)'(x) = f'(g(x))\,g'(x) = 5(\sqrt{x})^4\cdot\frac{1}{2}x^{-\frac{1}{2}} = \frac{5(\sqrt{x})^4}{2\sqrt{x}}$

$= 2.5(\sqrt{x})^3 = 2.5x\sqrt{x} \quad (f\circ g)'(1) = 2.5$

35. $f(u) = \cot\left(\frac{\pi u}{10}\right) \quad u = g(x) = 5\sqrt{x}$

$(f\circ g)(x) = \cot\left(\frac{\pi\sqrt{x}}{2}\right) \quad (f\circ g)'(x) = -\csc^2\left(\frac{\pi\sqrt{x}}{2}\right)\cdot\frac{\pi}{4}x^{-\frac{1}{2}}$

$(f\circ g)'(1) = -\csc^2\left(\frac{\pi}{2}\right)\cdot\frac{\pi}{4} = -\frac{\pi}{4}\left(\csc\left(\frac{\pi}{2}\right)\right)^2 = -\frac{\pi}{4}(1)^2 = -\frac{\pi}{4}$

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37. $f(u) = \frac{2u}{u^2+1}$ $\quad u = g(x) = 10x^2 + x + 1$

$$(f \circ g)(x) = f(g(x)) = \frac{2(10x^2+x+1)}{(10x^2+x+1)^2+1}$$

$$= \frac{20x^2+2x+2}{(10x^2+x+1)^2+1}$$

$(f \circ g)'(x) =$

$$= \frac{\left[(10x^2+x+1)^2+1\right](40x+2) - (20x^2+x+2)\left[2(10x^2+x+1)(20x+1)\right]}{\left((10x^2+x+1)^2+1\right)^2}$$

$$(f \circ g)'(0) = \frac{\left[(1)^2+1\right](2) - (2)\left[2(1)(1)\right]}{\left((1)^2+1\right)^2}$$

$$= \frac{[2](2) - (2)[2]}{(2)^2}$$

$$= \frac{4-4}{4}$$

$$= \frac{0}{4}$$

$$= 0$$